VITKEVICH, V. V.

USSR/ Astronomy - Solar crown

Card 1/1 Pub. 22 - 9/49

Authors : Vitkevich, V. V.

Title : Results of observations of radio-wave dispersion over electron heterogeneities of the solar crown

Periodical : Dok. AN SSSR 101/3, 429-432, Mar 21, 1955

Abstract : Results of observations of radio-wave dispersion over the solar crown are presented. The method of interferences was used for the observations with the help of marine interferometers (the observations were conducted at two stations). The crab nebula (= $0.5^h\ 31^m\ 40^s$ and = $22^\circ\ 10'$) was considered as the source of radio-waves propagating through the solar crown. It was concluded from the phenomena observed that the solar crown is very heterogeneous. Three references: 2 USSR and 1 English (1951-1952). Graphs.

Institution : Acad. of Sc., USSR, The P. N. Lebedev Physical Institute

Presented by : Academician M. A. Leontovich, December 20, 1954

VITKEVICH, V. V.

USSR/ Astronomy - A radio-telescope

Card 1/1 Pub. 22 - 13/62

Authors : Vitkevich, V. V.

Title : A new system of modulated radio reception of weak signals and its application to the construction of a radio-telescope of a high ressolving power.

Periodical : Dok. AN SSSR 102/3, 469 - 472, May 21, 1955

Abstract : A new method of radio-detection of weak signals is described. The method is based on the use of a radio-interferometer described in the author's previous work. Due to a further development of the radio-interferometer (double frequency modulations, swinging radio reception diagrams), a construction of a radio-telescope of a very-high ressolving power is suggested. Six references: 1 USA and 5 USSR (1952-1953). Diagrams.

Institution : The Acad. of Sc., USSR, P. N. Lebedev Physical Institute

Presented by: Academician M. A. Leontovich, March 3, 1955

VITKEVICH, V. V.

"Observations of the Spectra of Separate Short-Duration Solar Eruptions," and "Observations of the Solar Corona by the Intensification Method," two reports delivered at the Symposium on Radioastronomy held at the Jodell-Bank Experimental Radioastronomical Station, Manchester University, England, are summarized by the author in his account of this symposium in Vest. Ak. Nauk SSSR for January 1956.

Sum. 900, 26 Apr 56

-VITKEVICH, V. V.

Category : USSR/Radiophysics - Application of radiophysical methods I-12

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1970

Author : Vitkevich, V.V.
Title : Radio Interferometers and Radio Telescope of the Crimean Stations of the FIAN (Physics Inst. of the Acad. of Sciences).

Orig Pub : Tr. 5-go soveshchaniya po vopr. kosmogonii, 1955, M., AN SSSR, 1956, 14-34, Diskus. 34-36

Abstract : The Crimean station of the FIAN operates many radio telescopes in the decimeter and meter bands. The 10-cm setup operates on the modulation principle. The antenna is a parabolic reflector 7.5 m in diameter. The radiotelescope for the 23 cm wavelength has an antenna 4 m in diameter and operates on the modulation principle. The 50-cm radiometer also operates on the modulation principle. The bandwidth of the frequencies employed is 2 Mc. The sensitivity at a 4-second time constant is 4° relative to the antenna temperature. The antenna is a parabolic reflector 3 meters in diameter with a receiving dipole at the focus. Interference reception is used. Using the above equipment, the radio radiation from the sun was investigated. To investigate the spectrum of the short-period radiation flares from the sun in the 80-100 Mc band, a multi-channel radiospectrograph is used. Many setups in the meter band are based on the compensation principle. They are used to investigate radio radiation from the sun, the galaxy, and from local sources.

Card : 1/2

Category : U3SR/Radiophysics - Application of radiophysical methods I-12

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1970

Only interference reception is employed. The radiotelescope for 3.5 meters has two in-phase antennas, consisting of 24 half-wave vibrators each. The pass band of the receiver is 0.2 Mc, the noise factor is 5, and at a time constant of several seconds the sensitivity reaches 1-2% of the intrinsic noise. An analogous circuit is used for the 5.8 meter equipment. The antennas employed for some observations are parabolic cups 30 m in diameter, dug into the earth and covered by a metallic net. An in-phase antenna with 96 vibrators is available for systematic observation of the sun at 1.5 meters. In the discussion of the paper, Ya. Ya. Ikaunieks made a brief report on work on radioastronomy in Riga, where preparations are made to investigate the radiation of the Galactic background at 210 Mc.

Card : 2/2

VITKEVICH, V. V.

I-12

Category : USSR/Radiophysics - Application of radiophysical methods

Abs Jour : Ref Zhur - Fizika, No 1, 1957 No 1982
Inst : Physics Institute, Acad. of Sciences USSR
Author : Vitkevich, V.V.
Title : On Radio Waves from Quiet and Weakly-Disturbed Sun

Orig Pub : Tr. 5-go soveshchaniya po vopr kosmogonii. 1955, M., AN SSSR, 1956, 149-172 , diskus 172-173

Abstract : Report on the results of an experimental investigation of radiowaves from the sun in the decimeter (10, 23 and 50 cm) band and in the meter (1 and 1.5 m) band, carried out in 1951-1955 at the Crimean station of the Physics Inst. of the USSR Acad. of Sciences. A study was made of the distribution of the radio brightness over the disk, the shape of the corona, the position of the center of the radio waves, and the character of the radio waves. Twenty-three cm waves were used to carry out interference observations of the sun's radio waves, and also observations during the time of the partial eclipse on 25 June 1952 in Alushta. Comparison of the eclipse curve with theoretical curves has shown that a certain average distribution of the radio brightness is observed between the thin ring of the disk and the evenly-radiating disk models. The principal portion of the radiation from the sun comes from the bright ring at the edge of the disk, as is also confirmed by interference-observation data. The 50-cm marine interferometer was used to observe radio waves from

Card : 1/2

Category : USSR/Radiophysics - Application of radiophysical methods

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1982

the quiet sun. No asymmetry of the solar corona was observed in 1949, and in 1951 and 1953-4 the effective dimension of the solar corona was somewhat greater on the average in the direction of the equator than in the direction of the pole (the degree of shape asymmetry reached 25-30%). Measurements at 10 and 50 cm in 1953-54 showed that the position of the radio waves varies continuously from day to day, with the curve showing the variation of the center of the radio waves being quite similar to the curve showing the change in the amount of the sunspots. This indicates a connection between the sunspots with the appearance of additional sources of radio waves. It was noted at the same time that in the decimeter band: (1) the "radio spots" frequently rise earlier and set later than the visible spot; (2) the radiation "pattern" of the "radio spot" has no notable directivity; the attenuation of the intensity of radiation when a "radio spot" is located on the edge of the disk does not exceed 20-30% (optical thickness not greater than 0.3). Observations at 1 and 1.5 meters disclosed two states of radiowave radiation from the sun: a quiet state, and one characterized by the presence of individual small short-periods flashes of radiation (See Abstract 1989 for details). Bibliography, 13 titles.

Card 2/2

VITKEVICH, V.V.

Category : USSR/Radiophysics - Application of radiophysical methods I-12

Abs Jour : Ref Zhur - Fizika, No 1, 1957 No 1983

Author : Vitkevich, V.V., Chikhachev, B.M.
Title : Observation of Radio Waves from the Sun in the Meter Band During the Total Solar Eclipse of 25 February 1952.

Orig Pub : Tr. 5-go soveshchaniya po vopr. kosmogonii. 1955, M., AN SSSR, 1956, 174-178, diskus. 178-181

Abstract : Radio waves from the sun were observed at 1, 1.5, 2, and 2.6 meters in the strip of the total eclipse phase (Archman Station, Tudkmenian SSR). The eclipse curve obtained at 1 meter is almost fully symmetrical about the moment of the total eclipse phase; the 1.5-meter curve is somewhat asymmetrical, with the eastern part of the sun radiating somewhat stronger than the western one. Comparison of these results with observation data on the eclipses of 20 May 1947 and 30 June 1954 discloses a reduction in the solar corona (reduction in solar activity). The asymmetry of the curves observed at 2 and 2.6 meters, is even greater. By comparing their results with the results obtained by the French expedition in Khartoum, the authors reach the conclusion that the distribution of the intensity of the radio waves in the meter band over the solar disk may vary even during the eclipse observation time. Bibliography, 2 titles.

Card : 1/1

VITKEVICH, V.V.

Category : USSR/Radiophysics - Application of radiophysical methods I-12

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1985

Author : Vitkevich, V.V.
Title : Observation of the Scattering of Radio Waves by Electronic Irregularities of the Solar Corona.

Orig Pub : Tr. 5-go soveshchaniya po vopr. kosmogonii. 1956, M., AN SSSR, 1956, 203-223, diskus 223

Abstract : See Ref. Zhur. Fiz. 1956, 11256

Card : 1/1

VITKEVICH, V. V.

I-12

Category : USSR/Radiophysics - Application of radiophysical methods

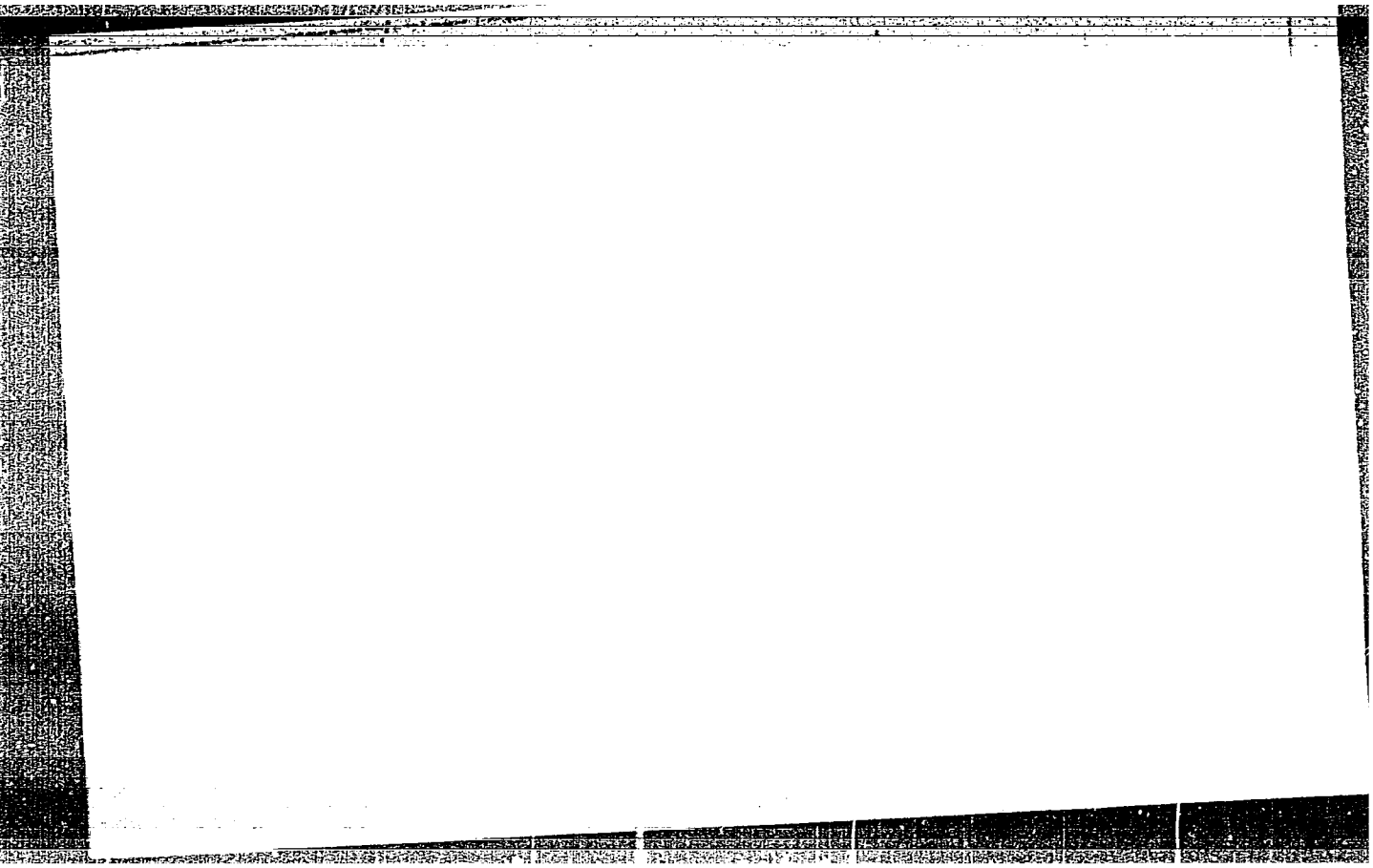
Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1990

Author : Vitkevich, V.V.
Title : On a New Type of Flare and on the Monochromatic Character of the "Pikes" of Radio Waves from the Sun

Orig Pub : Tr. 5-go soveshchaniya po vopr. kosmogonii. 1955, M., AN SSSR, 1956, 312-324

Abstract : See Ref. Zhur. Fiz. 1956. 8171

Card : 1/1



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VITKEVICH, V.V.

USSR / Radiophysics. Application of Radiophysical Methods I-9

Abs Jour : Ref Zhur - Fizika, No 5, 1957, No 12619

Author : Vitkevich, V.V., Kameneva, Z.I., Kovalevskiy, D.V.

Inst : Not given

Title : Multiple-Channel Radio Spectrograph and the First Results of Observations Made with it.

Orig Pub : Radiotekhn. i elektronika, 1956, 1, No 6, 864-868

Abstract : Description of a spectrograph, which consists of 18 individual receiving channels with a passband of approximately 1 Mc, equally distributed over the range between 80 and 120 Mc. The antenna is a truncated paraboloid measuring 18 x 8 meters, in the focus of which are placed two dipoles. Two high frequency amplifiers are used with bandwidths of 20 Mc

Card : 1/2

Vitkevich, V. V.

USSR/ Astronomy - Conferences

Card 1/1 Pub. 124 - 8/28

Authors : Vitkevich, V. V., Cand. of Phys-Math. Sc.

Title : Symposium on radio-astronomy at Jodrell-Bank

Periodical : Vest. AN SSSR 26/1, 50-54, Jan 1956

Abstract : Minutes are presented from the International Conference on Radioastronomy held in the fall of 1955, at the Experimental Radioastronomical Station Jodrell-Bank of the Manchester University in England. Names of personalities attending the conference are given. Illustrations of the radioastronomical equipment at Jodrell-Bank and in Cambridge (England) are included.

Institution : .....

Submitted : .....

VITKEVICH, V.V.

Solar supercorona and its influence on radiowave emission from the sun. Astron.zhur.33 no.1:62-73 Ja-F '56. (MLRA 9:6)

1.Fizicheskiy institut imeni P.N.Lebedeva.
(Radio astronomy) (Sun--Corona)

VITKEVICH, V.V.; CHIKHACHEV, B.M.

Some radio astronomical stations abroad. Astron. zhur.33 no.1: 120-126 Ja-F '56. (MIRA 9:6)
(Radio astronomy)

VITKEVICH, V.V.

Category : USSR/Radiophysics - Application of Radiophysical Methods I-12

Abs Jour : Ref Zhur - Fizika, No 2, 1957, No 4656

Author : Vitkevich, V.V., Udal'tsov, V.A.
Title : Observations of the Radio Waves from the Source in Taurus-A When the Latter is Eclipsed by the Moon.

Orig Pub : Astron. tsirkulyar, 1956, 22 apr., No 169, 5-6

Abstract : Report on preliminary results of observations of a discrete source of radio waves from Taurus-A, when the latter is eclipsed by the moon. The observations were carried out at 6.5 and 3.5 meters near Moscow on 30 November 1955 and 24 January 1956.

Since there was no increase in the amplitude of the interference record and in the shift of the maxima at the instants preceding the first and after the fourth contacts, it is concluded that the ionosphere of the moon is more than 10^{-4} rarer than that of the earth. The angular dimensions of the source are determined ($5' \pm 1'$ in direct ascent and $6' \pm 1.5'$ in declination). The irregularities of the distribution of intensity over the radiating region were detected, and also a shift in the coordinate of the effective center of the radio waves relative

Card : 1/2

to the optical center by 2.5', exceeding the error in the determination of the coordinates. A possible explanation for these peculiarities is offered.

VITKEVICH, V.V., and KOHURIN, J.L.

"Research on the Irregular Structure of the Ionosphere by means of Radio-astronomical Methods,"

paper presented at the 12th Gneral Assembly of the International Scientific Radio Union [URSI] at Boudler, Colorado, 22 Aug - 5 Sept 57

VITKEVICH, V.V.

"On Solar Radioemission,"

paper presented at the 12th Gneral Assembly of the Insternational Scientific Radio Union [URSI] at Boulder, Colorado, 22 Aug - 5 Sept 57

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VITKEVICH, V.V.

109-7-2/17

AUTHOR: VITKEVICH,V.V., KOKURIN,YU.L.

TITLE: Radiowave Refraction Irregularities and Considerable Discontinuities in the Ionosphere. (Neregulyarnosti refraktsii radiovoln i bol'shiye neodnorodnosti v ionosfere, Russian)

PERIODICAL: Radiotekhnika i Elektronika, 1957, Vol 2, Nr 7, pp 826-832 (U.S.S.R.)

ABSTRACT: The measuring method and the results obtained by the investigation of the vertical refraction of radio waves by cosmic sources in zenith angles of $z \simeq 90 - 70^{\circ}$, at a wave length of 4 m is described. It is shown that vertical refraction is frequently subject to irregular modifications and that irregular refraction is a result of the occurrence of electron heterogeneities with horizontal measurements of the order of 200 km in a height of ~ 350 km (F-layer). At such a distance the optical layer thickness can change by 15-20%.
Several models of the heterogeneous ionosphere are investigated. The daily development of the heterogeneities is analyzed, and it is shown that the occurrence of heterogeneities in the ionosphere is connected with sun activity. (With 7 Illustrations, 1 Table and 1 Slavic Reference).

Card 1/2

109-7-2/17

Radiowave Refraction Irregularities and Considerable Discontinuities in the Ionosphere.

ASSOCIATION: Physical Institute "P.N.LEBEDEV" of the Academy of Science of the U.S.S.R. (Fizicheskiy Institut im. P.N.Lebedeva AN SSSR)

PRESENTED BY:

SUBMITTED: 16.1.1957

AVAILABLE: Library of Congress

Card 2/2

Vitkevich, V.V.

109-12-12/15

AUTHORS: Vitkevich, V.V. and Udal'tsov, V.A.

TITLE: A New Radio-telescope (Novyy radioteleskop)

PERIODICAL: Radiotekhnika i Elektronika, 1957, Vol.II, No.12, pp. 1548-1549 (USSR)

ABSTRACT: The construction of a new, large radio-telescope was commenced in the Crimean research station of the Physics Institute of the Acad.Sc. USSR in July, 1957. The device (see the photograph on p.1548) is in the form of a paraboloidal segment, having a diameter of 31 m: it is dug into the soil and covered with concrete and metal. The telescope is fitted with a special trolley in its focus, which permits the adjustment of the directional pattern of the antenna and tracking the investigated radiation source. The telescope can be used to study the radiation of Taurus-A and that of the galaxy and metagalaxy, as well as that of individual discrete sources. Some preliminary measurements on the radiation of the sun and the Cancer nebulae were carried out at wavelengths of 50 to 10 cm. There is 1 photograph and 3 Slavic references.

SUBMITTED: August 3, 1957

AVAILABLE: Library of Congress

Card 1/1

VITKEVICH V.V.

26-12-3/49

AUTHOR: Vitkevich, V.V., Candidate of Physico-Mathematical Sciences

TITLE: The Sun's Supercorona (Sverkhkorona solntsa)

PERIODICAL: Priroda, 1957, No 12, pp 15-20 (USSR)

ABSTRACT: There are two ways of observing celestial bodies by radio waves, the method of individual radiation and the "translucent" one. The latter is based on the fact that objects or portions of matter located between the source of radiation leave "marks" on the radio waves that originate from behind them. The translucent method was applied by the Crimean observation station of the Institute of Physics of the AN, USSR (Fizicheskiy Institut AN, SSSR) to determine the sun's supercorona during the period 1952 - 1956. (Figure 1 shows the radiotelescope with which the observations were conducted). As source of radiation the Crab Nebula was chosen, which is farther away from the earth than the sun. It was found that radio waves originating from that nebula diminished in intensity when still 15 sun radii away from the sun, decreasing still more the nearer the sun approached the straight line between the source of radiation and the earth. By using interferencial radio reception and studying the scattering of radio

Card 1/2

waves, it was possible to separate the sun's radio emissions from those of the Crab Nebula. The results of these observations led to the conclusion that the scattering of radio waves was caused by electron non-uniformities extending over a distance of 5 to 20 sun radii. These electron formations are called the sun's supercorona and consist of immense clouds of ionized gas surrounding the sun. This region links together the solar corona and the zodiacal light.
There are 1 photo, 8 diagrams and 1 reference which is Slavic (Russian)

ASSOCIATION: Institute of Physics imeni P.N. Lebedev of the AN, USSR (Moskva) (Fizicheskiy Institut imeni P.N. Lebedeva Akademii nauk SSSR (Moskva)

AVAILABLE: Library of Congress

Vitkevich, V. V.

30-11-14/23

AUTHOR: Vitkevich, V. V.,
Candidate of Physico-Mathematical Sciences.

TITLE: Powerful Radiotelescope in the Crimea
(Moshchnyy radioteleskop v Krymu)

PERIODICAL: Vestnik AN SSSR, 1957, Vol. 27, Nr 11, pp. 110-112 (USSR)

ABSTRACT: A new radiotelescope was erected near the research station of the Physical Institute AN USSR imeni P. N. Lebedev. For this they used an earth-basin (zemlyanaya chasha) of the large radiointerferometer with whose aid the corona of the sun was investigated by means of the "method of radioscopy". This radiotelescope is a rigid dish- or cup-shaped parabolic structure (reflector), 31 m in diameter, sunk into the ground and reinforced with concrete, oriented to the vault of the sky with an inclination of +22°. A diagram of the radioemanation (sun) was taken on the wave-length 50 cm (sm). On the same wave the origin of the A-corpuscle (telets-A) was recorded with accuracy $\left[13 \cdot 10^{-24} W / m^2 \text{ Hz cycles (gts)}\right]$. Tests with 10 cm (sm)-waves and the preliminary result on the 3 cm (sm)-wave show that the telescope is usable on this short wave. The diagram of reception lay close to 4,5' (corresponding to the observation).

Card 1/2

Powerful Radiotelescope in the Crimea. 30-11-14/23

One of the most interesting objects of research -the origin of the A-corpuscle (telets-A) was identified with the Supernova (sverkhnova) NGC 1952. Later on other sources of emanation (within the inclination range 22°) shall also be investigated. The investigation of the radioemanation of NGC 6853 also is of great interest. The use of a second movable antenna the possibility of investigating the corona of the sun by means of "radioscopy" (prosvechivaniye) in the range of microwaves. In this manner they hope to obtain reliable date on the heterogeneity of the corona of the sun (distance 4-5 Ro). It is further assumed that the new radiotelescope will be very useful in the investigation of the radioemanation of the moon - possibly also of other planets.
There are 1 figure and 1 reference, 1 of which is Slavic.

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Card 2/2

AUTHOR: Vitkevich, V. V.

TITLE: Investigations of the Solar Supercorona by the reception of radio emission from Jupiter. (Ob issledovaniy sverkhkorony solntsa posredstvom priema radioizlucheniya yupitera).

PERIODICAL: "Astronomicheskiy Zhurnal" (Journal of Astronomy), 1957, Vol.34, No.2, pp. 217-221 (USSR).

ABSTRACT: The radioscopic method has been successfully employed in the study of the Solar corona (1 - 6). It is suggested that the radio emission from Jupiter may be employed in this method. The radio emission from Jupiter has the following characteristics:

(a) The intensity of the radiation is greatest at 12 - 15 metres and is of the order of the intensity of radiation from Taurus-A.

(b) The radiation is intermittent in character.

(c) The size of the radiating area is very small (less than 1').

These characteristics - high intensity and small angular width - are just those required by the radioscopic method. The fact that the intensity is highest in the long wave length range is the most useful in the study of the Solar supercorona. If the radiation from Jupiter is to be used, the finiteness of the distance from this planet to the Sun must be taken into account. This can be done

Investigations of the Solar Supercorona by the reception of radio emission from Jupiter. (Cont.)

quite simply from geometrical considerations. An interferometer was constructed in which one of the two antennae has a single main loop, and the other is made in the form of a grating consisting of eight loops (distance between the loops $5 \div 6^0$, loop width 1^0). Such a system will separate out the effects of sun-spots. Fig.4 gives the plot of the angular distance between Jupiter and the Sun as a function of time. Table 2 gives the dates in 1957, 1958 and 1959 on which this will be a minimum. A study of the supercorona during years of both maximum and minimum solar activity, will lead to information on the dependence of the latter on the phase of the solar cycle and its physical nature. 2 tables, 4 figures, 8 references, 6 of which are Russian.

Physical Institute imeni
P. N. Lebedev,
Ac. Sc., USSR.

Recd. July 16, 1956.

VITKEVICH, V.V.

33-3-6/32

AUTHOR: Vitkevich, V.V.

TITLE: Radio stars and methods of their investigation. (Radiozvezdy i metody ikh issledovaniya)

PERIODICAL: "Astronomicheskiy Zhurnal" (Journal of Astronomy), 1957, Vol. 34, No.3, pp. 349 - 364 (U.S.S.R.)

ABSTRACT: Using experimental results due to Ryle (1), (2), it is shown that the plot of log N vs. log I (where N = number of radio stars in one steriadian, having the intensity I) corresponds to the case of uniform distribution of sources but only for small N values (up to log N~0.4). After this value log N is greater than that predicted for a uniform distribution. This may be due either to an increase in the density of sources or an increase in their luminosity. In general, one has:

$$N(r) = \int_0^r \rho(r) r^2 dr; \quad I = L(r) r^{-2}$$

where $\rho(r)$ is the density of sources and the luminosity L is a function of distance r. The experimental curve of Ryle is used for calculating $\rho(r)$, assuming L = const. and L(r) assuming ρ = const. In order to choose between these two poss-

Card 1/3

Radio stars and methods of their investigation. (Cont.)

There are 5 figures and 2 tables, and 4 references, 1 of which is Slavic.

ASSOCIATION: Physics Institute imeni P.N. Lebedev, Ac.Sc. U.S.S.R. (Fizicheskiy Institut im. P.N. Lebedeva AN SSSR)

SUBMITTED: October 6, 1956

AVAILABLE: Library of Congress

VITKEVICH, V. V.

AUTHOR: Vitkevich, V. V. and Sigal, M. I. 33-5-5/12

TITLE: On the Radio Emission of Coronal Condensations.
(O Radioizluchenii Koronal'nykh Kondensatsiy)

PERIODICAL: Astronomicheskiy Zhurnal, 1957, Vol.34, No.5, pp. 716-723 (USSR).

ABSTRACT: It is known that the solar radio emission in the decimeter and meter region originates in the solar corona. Therefore, by studying this radiation it is possible to obtain information about the processes in these inner regions of the sun. The solar radio emission in the decimeter region can be represented as consisting of the following components: 1. radio emission of a "quiet sun", due to thermal radiation of the corona; 2. a slowly varying (with time) component connected with long lived formations such as spots, coronal disturbances etc.; 3. radio emission flares connected with fast solar processes e.g. chromospheric flares. In the present work some results of studies on the second component are reported. Observations were carried out at 50 cm. using a two antenna radiointerferometer. A modulated radiometer set up differentially was used as a receiver. The base of the interferometer was disposed along the west east direction. The dimensions of

Card 1/3

On the Radio Emission of Coronal Condensations.

the base were D = 35.95m = 71.3λ while the angular aperture of the central lobe was $\Delta\varphi$ = 47'. The relative dimensions of the base and the source were such that a clear interference picture could be obtained from the sun. Observations at 10 cm. were obtained using a single mirror-reflector. The reflector was in the form of a paraboloid of revolution and its diameter was 7.5m. while the angular width of the main lobe was 45'.8. Figure 1 shows typical records of the radio emission at 10 and 50 cm. The apparatus is more fully described by the first of the present author's in Ref. 13. As can be seen from figures 2a and 2b there is a close connection between the change in position of the effective centre of solar radio emission and the instant of coronal formations in the line 5303 Å. This applies to observations at 50 cm and 10 cm. It is shown that the variation of intensity in the green line is closely connected with changes in radio emission. In this way radio observations can be used to make deductions about coronal activity in the line 5303 Å without the use of optical observations. There are 7 figures, no tables and 14 references, 8 of which are Slavic and 4 of these are by the first of the present authors.

Radio stars and methods of their investigation. (Cont.)

ibilities, problems associated with the measurement of angular dimensions of radio stars as functions of N and I are considered. It is shown that such a measurement is possible, at least in principle, the distance between the antennae being of the order of 40 km. (for an interferometer used by Ryle).

It is shown that the most suitable type of antenna systems are those of the split cross type, as shown in Fig. 5. Their resolving power is much higher than that of large radio telescopes of the ordinary type, the active surface of which is limited by a convex curve (parabolic reflectors, synphase antennae, etc.). The sensitivity of these "ordinary" telescopes increases with area more rapidly than their resolving power, and they are of little use in measurements of angular size. In order to employ large antenna systems most effectively in radio-

Card 2/3 telescopes in recording the largest number of radio stars, it is necessary to pay special attention to side lobes. These may have a serious interfering effect.

In a recent paper, Khaykin (4) stated that it should be expected that the biggest radiotelescopes will be of the reflector type, and not the refractor type, just as in the analogous optical case. The present author argues against this supposition and is of the contrary opinion.

33-5-5/12

On the Radio Emission of Coronal Condensations.

SUBMITTED: February, 9, 1957.

ASSOCIATION: Physical Institute imeni P. N. Lebedev, Academy of Sciences of the USSR. (Fizicheskiy Institut im. P. N. Lebedeva, Akademii Nauk SSSR.)

AVAILABLE: Library of Congress.

Card 3/3

VITKEVICH, V. V.

with N. T. BASOV, "On the Probable Mechanism of Generation of nonequilibrium Radioemission of the Sun by Beta-electrons,"

with A. D. Kuzmin, V. A. Udaltsov, and Solomonovich, A. E., " Radioimage of the Sun on the 3 cm Warelength,"

papers submitted for the Sympsoium on Radio Astronomy, 30 Jul - 6 Aug 58, Paris

VITKEVICH, V. V.

"Polarization of 1.5 m Radioemission of the Sun," (with Y. I. Alekseyev)

"New Data About the Supercorona of the Sun,"

papers submitted for the Symposium on Radio Astronomy, 30 Jul - 6 Aug 58, Paris

AUTHOR: Vitkevich, V. V.

TITLE: Investigation of the Ionospheric Irregularities by Radio-Astronomical Methods (Issledovaniye ionosfernykh neodnorodnostey radioastronomicheskimi metodami)

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol 3, Nr 4, pp 478-486 (USSR)

ABSTRACT: The problem was investigated experimentally and the results are reported graphically. First, the refraction of metre and decimetre radio waves in the terrestial atmosphere was studied. The vertical refraction R is defined as the difference between the true zenith angle $z_и$ of the radiating source and the experimentally determined angle of the incoming radio waves, $z_э$. The refraction can thus be defined as:

$$R(z_э) = z_и - z_э \qquad (1)$$

In general $z_и$ is known and for the Sun it can be measured by assuming that it is measured with respect to its centre. During the periods of solar activity the Sun contains a number of local radiation sources and their co-ordinates can be determined by means of suitable calculations which take

Investigation of the Ionospheric Irregularities by Radio-Astronomical Methods

into account the rotation of the Sun. The problem is therefore reduced to the determination of $z_э$. Experimentally, $z_э$ can be determined by the interference method. The receiving antenna in this method was situated on a hill in the vicinity of the sea. The antenna received the direct wave as well as the wave reflected from the sea. If, due to the rotation of the Earth, $z_э$ changed, the difference in the path of the wave changed correspondingly and an interference pattern was produced. The position of maxima and minima of the interference pattern was used to determine the values of $z_э$ and subsequently $R(z_э)$. Some of the experimental results taken at wavelengths of 0.5 to 1.5 m are shown in Fig.2. Further graphs of $R(z_э)$ are shown in Figs.2 and 3.The curves were plotted forwavelengths ranging from 0.5 to 4 m. Similar curves were taken at a wavelength of 4 m for

Investigation of the Ionospheric Irregularities by Radio-Astronomical Methods

the radiation of "radio stars". These are shown in Fig.4. The above experimental results were used to determine the gradient of the optical path length and to estimate the electron inhomogeneities causing the irregularities in the vertical refraction. Curves of the optical path length as a function of z_3 are shown in Fig.6. Some measurements were also carried out on the horizontal ionospheric refraction and the results are reported in Fig.7; curve 1 of Fig.7 was taken on July 10, 1952 and curve 2 on July 13, 1952; the curves represent the variation of the refraction as a function of time. In all the aboye cases the irregularities were such that the interference pattern was not perturbed. However, during the measurements of the radiation of "radio stars" at a wavelength of 6 m and of the Sun at a wavelength of 3.5 m, it was noticed that the interference pattern can become distorted or would disappear altogether. This effect is illustrated by the curves of Fig.8 which show a gradual transition from a definite interference pattern to its

Investigation of the Ionospheric Irregularities by Radio-Astronomical Methods

almost complete disappearance. There are 8 figures and 2 Soviet references.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR (Physics Institute im. P. N. Lebedev of the Soviet Academy of Sciences)

SUBMITTED: August 30, 1956

1. Ionosphere--Refractive properties 2. Atmosphere--Refractive properties
3. Radio waves--Refraction 4. Mathematics--Applications

Card 4/4

SOV-109-3-6-9/27

AUTHORS: Vitkevich, V. V. and Udal'tsov, V. A.

TITLE: Application of the Interference Radio-Reception for the Registration of Rapid-Changing Processes (Primeneniye interferentsionnogo radiopriyema dlya registratsii bystro protekayushchikh vo vremeni protsessov)

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol 3, Nr 6, pp 784-793 (USSR)

ABSTRACT: The registration of rapid-changing processes by means of radio-interference techniques can be done by means of an interferometer with two receivers, such as shown in Fig.1, or by the interferometer shown in Fig.2. Both these interferometers register the interference in antiphase. The interferometer of Fig.1 is simpler, but that of Fig.2 is preferable since the combining of the two input signals is done at the intermediate frequency. The measurements can also be carried out by the method of "mobile radiation pattern", such as described by Ryle or Little or by Vitkevich (Refs.6, 7 and 1). Block schematics of two interferometers

Card 1/6

Application of the Interference Radio-Reception for the Registration of Rapid-Changing Processes

of this type are shown in Figs.3 and 4. The above interferometers have a number of disadvantages and a novel equipment was therefore designed. The equipment was used by the Crimean Station of the Physics Institute of the Soviet Academy of Sciences for the investigation of the distribution of the radio-brightness of Taurus-A during its lunar eclipse as well as in a number of other measurements. The interferometer is represented by the block schematic of Fig.5, in which the various blocks denote the following units: (1) antennas, (2) high frequency preamplifiers operating at 6.5 m and having a bandwidth of 3 Mc/s and a gain of 45 db, (3) 2-channel quartz-crystal local oscillator operating at 100 kc/s, (4) a frequency multiplier which increases the frequency of 1 channel to 34.2 Mc/s, (5) mixers, (6) a multiplier which increases the frequency of the 2nd channel to 34.3 Mc/s, (7) a combining or adding stage, (8) an intermediate frequency amplifier operating at 11.75 Mc/s and having a bandwidth of $\Delta f_B = 1$ Mc/s, (9) a square detector, (10) an amplifier operating at 100 kc/s and having a bandwidth of

Application of the Interference Radio-Reception for the Registration of Rapid-Changing Processes

Δf_H = 1 kc/s , (11) a linear amplitude detector, (12) a potentiometer and (13) a galvanometer. Functioning of the interferometer is analysed in some detail and it is concluded that the equipment can operate as a modulation interferometer (when using the second detector as a synchronous operating unit) or as a compensation interferometer (when both channels of the local oscillator operate at the same frequency). The equipment can also operate simultaneously as a modulation-compensation or a simple modulation interferometer; in the first case, the output quantity is proportional to the amplitude of the interference pattern, while in the second case the interference is registered without the DC component. The above equipment can be modified into an interference polarimeter which can be used in the investigation of the degree and the nature of the polarisation of the radio radiation of various discrete sources (the Sun, solar spots, radio-stars). The polarimeter or the polarisation interferometer is shown in the block schematic of Fig.6. It

Application of the Interference Radio-Reception for the Registration of Rapid-Changing Processes

consists of the following units: 1) local oscillator; 2), 3) and 4) are the units for producing 3 local frequencies, f_1, f_2 and f_3 such that $f_3 - f_1$ determines the modulation frequency of the polarised signal, while the difference $f_3 - f_2$ determines the modulation frequency of the combined signal; 5) mixers; 6) a combining stage; 7) an intermediate frequency amplifier; 8) a square detector; 9) an amplifier operating at the modulation frequency of the polarised signal; 10) an amplitude detector; 11) a potentiometer (a compensator); 12) a synchronous detector for separating the interference pattern of the polarised signal; 13) an amplifier operating at the modulation frequency of the combined signal (polarised and non-polarised); 14) an amplitude detector; 15) a potentiometer having a low depth of compensation; 16) a galvanometer which indicates the level of the combined signal; 17) a galvanometer which indicates the level of the interference of the polarised signal; the antenna A_1 is polarised in two mutually perpendicular directions

Card 4/6 and represents two independent systems; the antenna can be

Application of the Interference Radio-Reception for the Registration of Rapid-Changing Processes

in the form of a paraboloid fitted with two independent mutually-perpendicular linear radiators. Each of the two systems of antenna A_1 can work independently with the second antenna, A_2, whose polarisation coincides with one of the systems of A_1. The polarisation interferometer was tested experimentally and the results are shown in Figs.7 and 8. The curves of Fig.7 show the change in the power received by the two channels when the main plane of the polarimeter was rotated from 0 to 180°; the input signal was partially polarised. Fig.8 represents the change of the phase of the interference lobe when the plane of polarisation was rotated by 90°. The paper contains 8 figures and an appendix; it is

Application of the Interference Radio-Reception for the Registration of Rapid-Changing Processes

shown in the appendix that if the synchronous detector of the interferometer is replaced by a compensation-type detector, this should not lead to a decrease in the sensitivity of the modulation equipment. There are 8 figures and 9 references, 6 of which are Soviet and 3 English.

ASSOCIATION: Fizicheskiy institut AN SSSR im. P. N. Lebedeva (Physics Institute of the Soviet Academy of Sciences, imeni P. N. Lebedev)

SUBMITTED: November 22, 1956

1. Radio receivers - Interference 2. Interferometers - Applications 3. Radio receivers - Testing equipment 4. Radio receivers - Test results

SOV/109-3-11-4/13

AUTHORS: Vitkevich, V.V. and Kokurin, Yu.L.

TITLE: Measurement of the Phase and Amplitude Fluctuations of the Radio Waves Which Passed Through the Ionosphere (Izmereniye fazovykh i amplitudnykh fluktuatsiy radiovoln, proshedshikh skvoz' ionosferu)

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol 3, Nr 11, pp 1373 - 1378 (USSR)

ABSTRACT: For the purpose of this investigation, the ionosphere can be regarded as a screen which produces a certain amount of phase and amplitude modulation. It is therefore possible, by studying the modulation at a distance from the screen, to investigate the behaviour and the structure of the screen itself. This can be done provided the following conditions are fulfilled:
1) The length of the incident wave should be considerably smaller than the dimensions of the screen discontinuities (at metre waves this condition is always met);
2) The depth of the phase modulation produced by the screen should be less than 1 radian.
The problem can be studied by employing a double interferometer such as shown in Figure 1. This consists of two similar antennae, spaced at a distance b .

Card1/6

Measurement of the Phase and Amplitude Fluctuations of the Radio Waves which Passed Through the Ionosphere

If a plane wave impinges on the antennae at an angle α, the voltage at the input of the receiver Πp-1 (Figure 1) is given by Eq (1), where λ is the wavelength, l_1 and l_2 are the electrical lengths of the cables between the antennae and the receiver, while b is the base of the interferometer. The voltage at the output of the detector is proportional to the power at the input, as expressed by Eq (2). If the incidence angle α is varied, the output voltage of the receiver will describe an interference pattern, which can be expressed by Eq (3). If the signal from the antenna system is applied to two receivers which are connected in such a way that the difference in the electrical lengths of their feeder cables is Δl, the output voltages of the receiver are given by:

Measurement of the Phase and Amplitude Fluctuations of the Radio Waves which Passed Through the Ionosphere

$$\left.\begin{aligned} A_1 &= \frac{1}{2}\left[1 - \cos 2\pi x\right], \\ A_2 &= \frac{1}{2}\left[1 - \cos 2\pi (x - x_1)\right] \end{aligned}\right\} \qquad (4).$$

If at the instant corresponding to a phase x_o the intensity of the signal changes a certain amount, the increments of the receiver output voltages at the points x_o are given by Eqs (5), where a is the relative change in the signal strength. If both amplitude and phase fluctuations of the signal are present, the increments of the output voltages can be expressed by Eqs (7). It is possible to solve Eqs (7) with respect to a and Δx. From Eq (7), it can be seen that the most advantageous arrangement of the interferometer is such in which the phases of the two output voltages differ by π. The above interferometer technique was employed to carry out some

Measurement of the Phase and Amplitude Fluctuations of the Radio Waves Which Passed Through the Ionosphere

measurements. The experimental equipment employed two in-phase antennae operating a wavelength of $\lambda = 3.5$ m ; the antennae had an area of 59 m^2 and a beam width of 16^0 in the horizontal plane and 50^0 in the meridian plane. The distance between the antennae was 162.2 m so that the width of the main lobe of the directional pattern was 74'. The antennae were directed towards the radio stars Swan-A and Cassiopea. The receivers were the normal superheterodynes operating at a frequency of 86 Mc/s. The intermediate frequency of each receiver was 9 Mc/s, the overall bandwidth was 0.2 Mc/s and the time constant of the output device was 7 - 9 sec. The results of some preliminary measurements are shown in Figure 2. The continuous curves in the figure correspond to the signal of the source in the absence of fluctuations, while the remaining curves illustrate the fluctuation effects. The curves can be used to determine the amplitude increments ΔA_1 and ΔA_2 by the direct measurement of the peaks

Card4/6

Measurement of the Phase and Amplitude Fluctuations of the Radio Waves Which Passed Through the Ionosphere.

in the figure. The values of Δx and a could be evaluated from Eqs (7). The distribution of the quantities $\Delta\alpha$ and a are shown in Figures 3 and 4, from which it follows that the average value of a is 0.2 and the average value of $\Delta\alpha$ is 1.6'. The distribution curve of the duration of the fluctuations is given in Figure 5, from which it is seen that the most probable value of the duration is 30 sec. The above values can be used to determine the average phase gradient of the diffracting layer and this has a value of 85×10^{-5} radians m^{-1}. Also it is found that the average gradient of the electron density in the ionosphere is 85×10^{4} cm^{-2} m^{-1}.

There are 5 figures and 8 references, 6 of which are English and 2 Soviet.

SOV/109-3-11-4/13

Measurement of the Phase and Amplitude Fluctuations of the Radio Waves Which Passed Through the Ionosphere

ASSOCIATION: Fizicheskiy institut im. P.N. Lebedeva AN SSSR (Institute of Physics im. P.N. Lebedev of the Ac.Sc.USSR)

SUBMITTED: May 18, 1957

Card 6/6

VITKEVICH, V.V.

New data on the supercorona of the sun [with summary in English].
Astron. zhur. 35 no.1:52-63 Ja-F '58. (MIRA 11:3)

1. Fizicheskiy institut im. P.N. Lebedeva AN SSSR.
(Sun--Corona)

3(1)

AUTHOR: Vitkevich, V.V. SOV/33-35-2-21/21

TITLE: Twelfth General Assembly of the URSI (Radio Astronomy) (Dvenadtsataya general'naya assambleya URSI (Radioastronomiya))

PERIODICAL: Astronomicheskiy zhurnal, 1958, Vol 35, Nr 2, pp 313-320 (USSR)

ABSTRACT: This is a report on the 12th general assembly of the URSI which took place in Colorado, U.S.A., from August 22 to September 5, 1957. It contains a short index of the most essential lectures, and a list (collected by D.V.Korol'kov) of existent radio-telescopes and such being built of the western world about which there was reported at the assembly.
There is 1 figure.

SUBMITTED: January 16, 1958

Card 1/1

USCOMM-DC-60810

33-35-3-7/27

AUTHOR: Vitkevich, V.V. and Kaneneva, Z.I.

TITLE: Outbursts of Solar Radio Emission (Vyprosy radioizlucheniya na solntse)

PERIODICAL: Astronomicheskiy zhurnal, 1958, Vol 35, Nr 3, pp 372-381 (USSR)

ABSTRACT: The outbursts of solar radio emission were measured with the aid of a multichannel radiospectrograph with the frequences 165, 160, 156, 152, 115, 105, 100, 96, 91, 86 and 82 mc. and the recording velocity up to 7 cm min^{-1}. The paper contains the results of the measurements and consists of 6 paragraphs. § 1. Description of the method and of the apparatus § 2. Dynamical spectrum. § 3. Duration and intensity of outbursts. § 4. Velocity of the disturbing agent. § 5. Concerning the connection between the outbursts of radio emission and the chromospheric flares. § 6. Conclusion: Intensity of the outbursts = $(1 \div 10) \cdot 10^{-21}$ W (c./s.)$^{-1}$. The drift velocity decreases with the frequency from 70 mc./s. to 15mc./s for frequency variations of 200 to 100 mc. The velocity of the disturbing agent of 30 - 10^3 km sec^{-1} on an average corresponds to this. The increase of the intensity takes place

Card 1/2

Outbursts of Solar Radio Emission 33-35-3-7/27

quicker (2 sec) than the decrease (7 sec. up to half the power). The duration of the outbursts is 25 ; 40 sec., often it increases for lower frequencies. The spectrum is not less than 118 mc in most cases. In single cases, however, it is limited by a strip of 30 mc. The velocity of drift with regard to the frequency does not depend on the intensity and duration of the radio emission. Between the outbursts and the chromospheric flares no definite relation was stated.
There are 1 table, 8 figures, and 6 references, 4 of which are Soviet, and 2 American.

ASSOCIATION: Fizicheskiy institut imeni P.N. Lebedeva Akademii nauk SSSR (Physical Institute imeni P.N. Lebedev of the Academy of Sciences of the USSR)

SUBMITTED: August 24, 1957

Card 2/2

3(:)
AUTHORS: Udal'tsov,V.A., and Vitkevich,V.V. SOV/33-35-5-4/20

TITLE: On the Intensity Distribution of the Discrete Source of Radio Emission, Taurus-A (O raspredelenii intensivnosti diskretnogo istochnika radioizlucheniya Telets-A)

PERIODICAL: Astronomicheskiy zhurnal, 1958, Vol 35, Nr 5, pp 713-721 (USSR)

ABSTRACT: The results of the present paper are already announced in [Ref 3]. By the interferometric method on 3.5m the authors studied the distribution of radio brightness of Taurus-A during its occultation by the Moon on November 30, 1956. The observation method is described. The authors found a non-uniform distribution of radio brightness and non-radial symmetry. The source of radio emission is elongated in the SE direction. The major and minor axes of the region of radio emission and of the optical region are determined and compared. The obtained results are discussed theoretically. The authors thank S.B.Pikel'ner for the discussion of some questions.
There are 5 figures, and 15 references, 9 of which are Soviet, 3 American, 1 English, 1 French, and 1 Dutch.

ASSOCIATION: Fizicheskiy institut imeni P.N.Lebedeva Akademii nauk SSSR (Physical Institute imeni P.N.Lebedev of the AS USSR)

SUBMITTED: August 24, 1957

Card 1/1

20-118-6-11/43

AUTHORS: Vitkevich, V. V., Kuz'min, A. D., Salomonovich, A. Ye., Udal'tsov, V. A.

TITLE: A Radio Image of the Sun on 3,2 cm Wave Length (Radioizobrazheniye Solntsa na volne 3,2 cm)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol. 118, Nr 6, pp. 1091-1093 (USSR)

ABSTRACT: In July, 1957, the construction of a new great radiotelescope which consists of a stationary parabolic reflector with a diameter of 31 m was begun on the Crimean station of the Institute of Physics imeni P. N. Lebedev of the Academy of Sciences of the USSR (Krymskaya stantsiya Fizicheskogo instituta im. P. N. Lebedeva AN SSSR). The geometric axis of the paraboloid is inclined by + 22° in the meridian plane which facilitates the annual observation of the radio radiation of the sun in June-July. In July, 1957, the investigation of the two-dimensional distribution of the intensity of the radio radiation over the sun disk was started on the wave lengths 3,2 and 10 cm. For this work the radio-spectrometers worked out by A. Y. Salomonovich and

Card 1/3

A Radio Image of the Sun on 3,2 cm Wave Length

20-118 -6-11/43

A. D. Kuz'min were used. The occurring signal was modulated by means of ferrites and circular wave guides. The carrying-out of the measurements is discussed in short. These measurements made possible the recording of the curves of the distribution of intensity of the radio radiation over the sun disk, i.e. on a series of subsequent strips the orientation of which approaches the north-south direction. The totality of these curves permits the construction of a two-dimensional image of the distribution of the radio brightness. The small width of the diagram on the wave 3,2 cm makes possible the detection of a very detailed image of the distribution, i.e. a radio image of the sun. On the wave 10 a rather coarse image of the distribution is obtained because of the great width of the diagram. The radio isophotic lines of the sun on the wave lengths 3,2 and 10 cm are illustrated in several figures. In the case of passage of the sun single regions with increased radio brightness occur in the diagram which is observed as a dazzling flash in the recording. With the wave length 3,2 cm regions with increased radio brightness are observed which are distributed very irregularly over the disk. The position of

Card 2/3

these regions is very similar to the position of the groups of the optic spots observed on the same days. The radio isophotes on the wave length 10 indicate the existence of active regions the position of which is also similar to the position of the optic spots and of the active regions with the wave length 3,2 cm. At present the measuring results obtained are exploited and compared to the optical data. There are 1 figure and 1 reference, which is Soviet

ASSOCIATION: Fizicheskiy institut im P. N. Lebedeva Akademii nauk SSSR (Institute of Physics imeni P. N. Lebedev, AS USSR)

PRESENTED: September 25, 1957, by D. V. Skobel'tsyn, Member of the Academy, USSR

SUBMITTED: September 19, 1957

VITKEVICH, V.V.

PHASE I BOOK EXPLOITATION SOV/3405

Soveshchaniye po voprosam kosmogonii. 6th, Moscow, 1957

Vnegalakticheskaya astronomiya i kosmologiya; trudy soveshchaniya (Extragalactic Astronomy and Cosmology; Transactions of the 6th Conference on Problems of Cosmogony, June 5-7, 1957) Moscow, AN SSSR, 1959. 273 p. Errata slip inserted. 1,500 copies printed.

Sponsoring Agency: Akademiya nauk SSSR.

Ed. of Publishing House: L.V. Samsonenko; Tech. Ed.: O.N. Shevchenko; Editorial Board: D.A. Frank-Kamenetskiy (Resp. Ed.) Professor; B.A. Vorontsov-Vel'yaminov, Corresponding-Member.

PURPOSE: The book is intended for astronomers and physicists studying problems of general cosmology.

COVERAGE: The book is a collection of papers on cosmogony read by scientists participating in a conference held in Moscow on June 5-7, 1957. The papers review recent observational and theoretical work in extragalactic astronomy, gravitational theory, theory of relativity, red shift, radio astronomy, formation of chemical elements, thermodynamics of the universe, entropy, etc. No personalities are mentioned. There are references following most of the reports.

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AUTHORS: Vitkevich, V.V., Panovkin, B.N. and Sukhovey, A.G.

TITLE: The Structure of the Electron Non-homogeneities in the Solar Super-corona

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1959, Vol 2, Nr 6, pp 1005 - 1007 (USSR)

ABSTRACT: One of the authors (V.V. Vitkevich, Refs 1-3) carried out some investigations of the solar super-corona during 1954-1958. However, his observations gave comparatively little information on the form of the scattered source. In the following the results of additional observations are represented. The investigations were carried out at the Krymskaya stantsiya FIAN (Crimean Astronomical Station) at the wavelength of 5.8 m by means of two radio-interferometers. Systematic observations were carried out during the whole of June, 1959. During this period the solar activity was comparatively stable and did not disturb the radiation from a source in the constellation of Taurus. A curve showing the intensity of the radiation from the source (which was covered by the solar-corona) is shown in Figure 1. It is seen (Curve 1) that the

Card1/3

The Structure of the Electron Non-homogeneities in the Solar Super-corona

intensity decreased considerably on June 8; later, the intensity dropped further and reached a minimum value between June 14 and 16; further, the intensity increased and, beginning from June 24, it became constant. However, if the interferometer was oriented from East to West (Curve 2 of Figure 1) the intensity of the radiation followed a different pattern. At the Serpukhovskaya radiofizicheskaya stantsiya FIAN (Serpukhovo Radio-physics Station) it was possible to carry out the measurements at the wavelength of 3.5 m. The observations were done during mornings and evenings by employing an interferometer having a base of 320 m. The results obtained permitted the plotting of a curve showing the variations of the relative modulation depth during the morning measurements (Figure 3). The evening observations produced only a few points; these are denoted by crosses in Figure 3.

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The Structure of the Electron Non-homogeneities in the Solar Super-corona

There are 4 figures and 6 Soviet references.

ASSOCIATION: Fizicheskiy institut im. P.N. Lebedeva AN SSSR
(Physics Institute imeni P.N. Lebedev of the Ac.Sc., USSR)

SUBMITTED: December 7, 1959

4

Card 3/3

SOV/109-4-1-3/30

AUTHORS: Vitkevich, V. V. and Kokurin, Yu. L.

TITLE: Investigation of the Winds and Non-Uniformities in the Ionosphere by Radio-Astronomical Methods (Issledovaniye vetrov i neodnorodnostey v ionosfere radioastronomicheskim metodom)

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 1, pp 17-20 (USSR)

ABSTRACT: The investigations described were carried out by means of an equipment consisting of 3 antennas and 3 receivers (see Fig.1). The antennas were identical and, in the meridian plane, they had an inclination angle of $\delta = 49.5^{\circ}$. Each antenna was in the form of a paraboloidal reflector with a square aperture having an area of 170 m^2. The width of the directional pattern of the antenna was 21° and the focal distance of the paraboloid was 6.7 m. A half-wave dipole was situated in the focus of each reflector and at a distance of 0.2 λ from it was situated a half-wave reflecting dipole. The 3 receivers were situated in the same place. Each receiver comprised a 2-stage high-frequency amplifier, a heterodyne, a mixer, a 4-stage intermediate-frequency amplifier, a detector, a 2-stage DC push-pull amplifier and a registering device. The intermediate frequency was 10 Mc/s and the bandwidth of the receiver was 0.4 Mc/s. The anode and heater

Card 1/3

Investigation of the Winds and Non-Uniformities in the Ionosphere by Radio-Astronomical Methods

supplies of the receivers were stabilised. The equipment was used to carry out the measurements on the radio stars in the constellations of Cygnus and Cassiopeia. The measurements were done at a wavelength of 6 m during December 1954 and April 1955. The recordings obtained were in the form shown in Fig.2. From such recordings it was possible to determine the magnitude and the direction of the wind velocity in the ionosphere; the velocity v and the direction β' could be evaluated from Eqs.(1), where the meaning of various symbols should be clear by referring to Fig.1. For the West-East velocity component, it was necessary to determine a correction and this was found to be of the order of 20 m/s. The results of the measurements can be summarised as follows: during 13 minutes on 9.12.54 it was found that the velocity was 70 m/s and $\beta = 250^0$; later, the velocity increased rapidly to 90 m/s and β was about 40^0 for a duration of 6 min; on the 19.12.54 the velocity was 90 m/s and $\beta = 280^0$; these values

Investigation of the Winds and Non-Uniformities in the Ionosphere by Radio-Astronomical Methods

were constant during 13 minutes; on the 2.4.55 the velocity was 85 m/s and $\beta = 150^{\circ}$; the values were constant during 12 min. The recordings were also used to determine the dimensions of the diffraction spots and it was found that for the direction A_1A_2 the spots had lengths of 1200, 2500 and 2000 m for the above 3 cases, respectively. The paper was read at the Colloquium of the Oscillation Laboratory of the Physics Institute of the Soviet Academy of Sciences on the 8th February, 1956. The paper contains 2 figures and 10 English references.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva, AN SSSR (Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR)

SUBMITTED: May 18, 1957.

3(1)
AUTHOR: Vitkevich, V.V.

SOV/33-36-1-30/31

TITLE: Symposium on Radio Astronomy in Paris on July 30 - August 7, 1958

PERIODICAL: Astronomicheskiy zhurnal, 1959, Vol 36, Nr 1, pp 194-198 (USSR)

ABSTRACT: This is a report on the radio astronomical symposium 1958 in Paris. Soviet delegation: V.V.Vitkevich (FJAN), V.A.Sanamyan (Byurakan Astronomical Observatory), I.G.Moiseyev (KRAO). The author describes the radio astronomical station in Nancy. In addition to the above scientists, B.N.Panovkin and Y.I.Alekseyev participated in the talks. In the discussion V.A.Udal'tsov, A. Kuz'min, and A.Salomonovich are mentioned.

SUBMITTED: October 15, 1958

Card 1/1

3(1)
AUTHORS: Vitkevich, V.V., and Panovkin, B.N. SOV/33-36-3-22/29

TITLE: On the Question of the Structure of the Nonuniformities of the Solar Supercorona

PERIODICAL: Astronomicheskiy zhurnal, 1959, Vol 36, Nr 3, pp 544-546 (USSR)

ABSTRACT: This is a report on the observations carried out on June 13, 1957 in the radiophysical station of the FIAN in the Serpukov. The base of the observations was the scattering of radio waves emitted by the Crab nebula at the nonuniformities of the solar supercorona, when the latter covers the Crab nebula. The distribution of intensity of the emitted and scattered waves leads to the statement that the nonuniformities of the supercorona have the form of oblong streams running nearly radially. It is possible that the nonuniformities run along the lines of force of the magnetic field of the Sun. On the published results it was reported partly in December 1957 at the extended full assembly for radio astronomy, and completely on May 15, 1958 in the colloquy of the

Card 1/2

On the Question of the Structure of the Nonuniformities of the Solar Supercorona

SOV/33-36-3-22/29

sector of radio astronomy of the Physical Institute imeni P.N.Lebedev.
There is 1 figure and 1 Soviet reference.

ASSOCIATION: Fizicheskiy institut imeni P.N.Lebedeva Akademii nauk SSSR (Physical Institute imeni P.N.Lebedev of the AS USSR)

SUBMITTED: August 15, 1958

Card 2/2

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AUTHOR: Vitkevich, V.V.

TITLE: The Structure of Irregularities and the Regular Magnetic Field of the Solar Supercorona

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1960, No. 4, pp. 595 - 605

TEXT: This paper was first read at a meeting of the Commission for Solar Studies (Pulkovo, May, 1959).
The present paper is concerned with the observations carried out between 1951-1958 at the Krymskaya nauchnaya stantsiya FIAN (Crimean Scientific Station of the Physics Institute of the AS USSR). These results were first reported by the present author in Ref. 1. These observations indicate that the supercorona contains anisotropic irregularities and that the scattering of radio waves is also anisotropic. It was found that the scattering of radio waves was different for interferometer bases having different orientations. The work was carried out on 3.5 and 5.8 m. The most reliable results were obtained in 1958 on 5.8 m, when the supercorona overlapped the Crab nebula. The interferometer bases were in the east-west,

Card 1/4

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E032/E314

The Structure of Irregularities and the Regular Magnetic Field of the Solar Supercorona

north-east, and south-west directions. The present paper gives a calculation of the scattering angles which follow from observations for these two base directions. The method employed was described previously by the present author in Ref. 4. The 1958 observations are summarised in Tables 1 and 2, where M'J denotes the amplitude of the observed interference pattern during the eclipse measured relative to the amplitude outside the eclipse, M_o is the modulation depth for a given base D outside the eclipse, and $2\Phi_p$ is the scattering angle.

Fig. 1 plots the angle of scattering $2\Phi_p$ (in min.) as a function of the distance from the centre of the Sun (r) (1958, $\lambda = 5.8$ m). The curves marked 1 refer to the first phase of the eclipse; curves marked 2 refer to the second phase of the eclipse. The continuous curves are for a base at an angle of 14^0 to the north-south line and the dotted curve is for the base in the east-west direction. Fig. 2 shows the

The Structure of Irregularities and the Regular Magnetic Field of the Solar Supercorona

apparent dimensions and the form of the Crab nebula for different distances from the Sun (first phase of the eclipse). The point C is the centre of the solar disc. As can be seen from Figs. 1 and 2, the outer boundary of the source of the radiation has a very elongated form for large r . Such an anisotropy in the scattering can be explained by assuming that the irregularities are in the form of "rays elongated in the direction of the magnetic lines of force. Fig. 3 plots the angle α_o between the vertical and the direction of the major axis of the scattering ellipse as a function of r . The continuous curve was obtained theoretically for a radial structure of electron irregularities. The theoretical curve was obtained by assuming that the major axis of the ellipse is perpendicular to the radial direction. An integral equation is set up for the scattering of radio waves on radial irregularities in the form of rays and a solution of this equation is given. Since the irregularities are now shown to be anisotropic, this fact must be taken into account in calculations on the effect of the supercorona on

Card 3/4

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E032/E314

The Structure of Irregularities and the Regular Magnetic Field of the Solar Supercorona

the apparent dimensions of active regions on the Sun. The paper is concluded with an estimate of the regular magnetic field in the supercorona and it is shown that at distances of 10-30 solar radii the field may be of the order of 10^{-4} - 10^{-5} Oe. In view of the existence of a constant magnetic field in the neighbourhood of the Sun, it is quite possible that there are magnetic traps which capture electrons and protons, similarly to the terrestrial magnetic traps. There are 5 figures, 3 tables and 7 Soviet references.

ASSOCIATION: Fizicheskiv institut imeni P.N. Lebedeva AN SSSR (Physics Institute imeni P.N. Lebedev, AS USSR)

SUBMITTED: February 16, 1960

Card 4/4

3,1700

S/141/60/003/03/001/014
E032/E314

AUTHORS: Vitkevich, V.V. and Matveyenko, L.I.

TITLE: Radio Image of the Sun on 3 cm Wavelengths

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1960, Vol. 3, No. 3, pp 351 - 366

TEXT: New observations have been carried out of the solar radio emission on 3.2 cm, using the 31 m fixed radio telescope of the Crimean Scientific Station FIAN. Figure 1a shows the radio image of the sun on 3.2 cm (July 22, 1957), which was obtained with this radio telescope. The numbers indicate the aerial temperatures in thousands of degrees. The dotted curve indicates the boundary of the optical disc of the sun. In order to convert the numbers into the brightness temperatures they should be multiplied by three. Figure 1b shows the 21 cm image obtained by the Australian workers (8.5×10^4 °K = 1 unit). The latter picture was obtained on the same day. There is a close connection between the two images, in particular, both include three well-defined regions of enhanced emission. Figs. 2a and 2b show the corresponding images for July 18, 1957. Again, there is a general correspondence between this picture and the picture shown in Fig. 2b, which was obtained on 21 cm. Figs. 3a and 3b show further images on the two wavelengths obtained

Card1/3

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Radio Image of the Sun on 3 cm Wavelengths

on July 21, 1957. Table 1 gives detailed information about the characteristics of the enhanced areas for five dates between July 18 and July 25, both on 3 cm and 21 cm. It is shown that the regions of enhanced intensity of radio emission of the wavelength region between 1.5 cm and 21 cm are, in the majority of cases, optically thin. Data are reported on the displacement of the effective centre of solar radio emission (Fig. 2). Fig. 7 shows a comparison between the displacements of the effective centres of solar radio emission on 3.2 cm and 1.6 cm in January, 1958. The maximum displacement of the effective centre during that period was found to be 3.5' on 3.2 cm and 2' on 1.6 cm. The average ratio of the displacements $\Delta r_{3.2}/\Delta r_{3.6}$ was found to be 2.6, from which it follows that the corresponding ratio of the brightness temperatures should be between 1 and ~ 4, depending on the optical thickness τ. A consideration of the radio images obtained on 3.2 cm in 1957 and 1958 (Figs. 10-12) shows that the form of the radio isophots into which the solar disc can be inscribed changes from day to day. The deviation of the

Card 2/3

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Radio Image of the Sun on 3 cm Wavelengths

radio-isophots from a circle is governed by coronal condensations and the radiation pattern of the radio telescope. The maximum deviation of the isophots from a circle is observed in the region near the Equator. The paper is concluded with a report on the polarisation data obtained with the above equipment. In Figs. 10-10d, the differently shaded areas have opposite polarisations. These polarisation data indicate the presence of circular polarisation over the areas of enhanced intensity. There are 12 figures, 1 table and 8 Soviet references.

ASSOCIATION: Fizicheskiy institut im. P.N. Lebedeva AN SSSR
(Institute of Physics im. P.N. Lebedev of the Ac.Sc., USSR)

SUBMITTED: January 14, 1960

Card 3/3

3.1540

78005
SOV/33-37-1-5/31

AUTHOR: Vitkevich, V. V.

TITLE: Observations of the Solar Upper Corona Between 1951 and 1958

PERIODICAL: Astronomicheskiy zhurnal, 1960, Vol 37, Nr 1, pp 32-41 (USSR)

ABSTRACT: In three of his previous papers published in 1958 and 1959, the author concluded that the size of the solar upper corona varies with the 11-year cycle of solar activity. In the present paper he discusses in detail, observations of the radio waves emitted from the Crab nebula during its occultations by the corona. The observations were made at the Krym station of the Physics Institute of the Academy of Sciences with a radiointerferometer whose base line varied from 410 to 731 meters. The quantity $2p$ recorded for every year from 1951 to 1958, and called "the angle of scattering," is a measure of the electron density

Card 1/3

Observations of the Solar Upper Corona
Between 1951 and 1958

78005
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of the corona at a given distance from the sun; it is given in 16 tables. The observations are grouped according to whether they are on the preceding or on the following side of the sun; the corresponding distances from the solar disk are r_1 and r_2. Then, the degree of asymmetry of the upper corona is $2(r_2 - r_1)/(r_2 + r_1)$. When is plotted as function of $\frac{1}{2}(r_1 + r_2)$, it appears that during the minimum of solar activity the assymetry is greater for outer portions of the upper corona than for its inner portions; the reverse occurs during the maximum activity. Furthermore, the size of the upper corona is much greater during the maximum than during the minimum activity. Finally, the average electron concentration is 1.7 times greater during maximum than during the minimum. The author concludes that in one half-year, matter thrown out from the sun reaches distances up to 20 solar radii, and disagrees with

Card 2/3

Observations of the Solar Upper Corona Between 1951 and 1958

78005
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A. Hewish whose conclusion was that the upper corona is formed by evaporation and ionization of particles falling down toward the sun. However, he admits the possibility that plasma eventually returns to the sun. There are 6 figures; 19 tables; and 6 references, 5 Soviet, 1 U.K. The U.K. reference is: A. Hewish, A. Report at the Symposium on Radio Astronomy, Paris, August, 1958.

ASSOCIATION: Lebedev Institute of Physics of the Academy of Sciences of USSR (Fizicheskiy institut imeni P. N. Lebedeva Akademii nauk SSSR)

SUBMITTED: May 1, 1959

Card 3/3

VITKEVICH, V.V.

Structure of the solar supercorona. Dokl. AN SSSR 156 no. 5: 1065-1067 Je '64. (MIRA 17:6)

1. Fizicheskiy institut im. P.N.Lebedeva AN SSSR. Predstavleno akademikom V.A.Kotel'nikovym.

6.9417

83231

S/033/60/037/004/003/012
E032/E314

AUTHORS: Vitkevich, V.V. and Gorelova, M.V.

TITLE: Dynamic Spectra and Principal Characteristics of Short-duration Peaks (Pips) in Solar Radio Emission

PERIODICAL: Astronomicheskiy zhurnal, 1960, Vol. 37, No. 4, pp. 622 - 630

TEXT: The observations reported in the present paper were carried out at the Krymskaya nauchnaya stantsii FIAN (Crimean Scientific Station of FIAN). The multichannel radiospectrograph, described by the first of the present authors et al in Ref 1, was employed. The existence of well-defined types of peaks and also groups of peaks was established. Two types of peaks were detected, namely, narrow-band (P_1) and wideband (P_2). Figure 1 gives the histograms of the duration of the peaks on 140, 107 and 77 Mc/s, respectively. A further type of peak is denoted by L and has a relatively long duration. Other effects detected consist of the appearance of groups of peaks which are classified as P_{g_1} (narrow-band groups consisting of narrow-band peaks), P_{g_2} (wide-band peaks forming wideband groups) and, finally, P_{g_3} (narrow-band

Card 1/3

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E032/E314

Dynamic Spectra and Principal Characteristics of Short-duration Peaks (Pips) in Solar Radio Emission

peaks independent of each other and forming a wideband group). A detailed classification and description of all these types is given. A typical L record is shown in Fig. 5, while Figs. 8 and 10 show typical P_{g_1}, P_{g_2} and P_{g_3} records. The principal characteristics of the various types of peaks in the metre range are summarised in the following table:

	I/I_0	τ, s	$\Delta\nu$, Mc/s	V Mc/s	V' km/s	No. of peaks per hr during an active day	Polarization
P_1	~ 1	0.8	<4	-	-	120	Up to 100% in 32% of cases
P_2	~ 1	0.8	13	-17	~0.1c	30	No data
P_{g_1}	~ 3	1/30	<4	-	-	2	"
P_{g_2}	~ 3	2/60	≥70	-20-+20	~0.1c	1	"
P_{g_3}	~ 3	1/60	~20	-	-	1	"
L	~ 2	5-6	≥70	-3 - -20	10^3-0.1c	5	"

Card2/3

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E032/E314

Dynamic Spectra and Principal Characteristics of Short-duration Peaks (Pips) in Solar Radio Emission

In the above table, I/I_0 is the intensity expressed as a fraction of the intensity for an undisturbed Sun, τ is the duration, $\Delta\nu$ is the bandwidth, V is the frequency drift velocity, V' is the velocity of the corresponding motion of the disturbing agent through the solar corona subject to the condition that the emission takes place from the level $n = 0$. There are 10 figures, 1 table and 7 references: 4 Soviet and 3 English.

ASSOCIATION: Fizicheskiy institut im. P.N. Lebedeva Akademii nauk SSSR (Physics Institute im. P.N. Lebedev, Academy of Sciences of the USSR)

SUBMITTED: September 17, 1959

Card 3/3

6.9417
3.1720(1041,1126,1127)

87244
S/033/60/037/006/002/022
E032/E514

AUTHOR: Vitkevich, V. V.

TITLE: Radio Astronomical Observations of Moving Clouds of Plasma in the Solar Supercorona

PERIODICAL: Astronomicheskiy zhurnal, 1960, Vol.37, No.6, pp.961-968

TEXT: It is now well known and reasonably well explained that the apparent radio diameter of the Crab nebula is appreciably increased as a result of scattering of radio waves by irregularities in the supercorona. Usually, observations carried out over a few hours do not show any rapid changes in the intensity of the angular dimensions of this source during its occultation by the solar supercorona. However, in isolated cases this regular behaviour is not followed. Such cases were reported by the present author in Refs. 1 and 2. Thus, when the angular distance between the Sun and the source was 10 to 15 solar radii, rapid change in the amplitude of the signal was occasionally observed, and sometimes even a complete disappearance of the radio interference record due to the Crab nebula. An analogous effect was observed by Australian workers (Ref.3). In the present paper an attempt is made to provide a possible mechanism for this effect and to deduce

Card 1/3

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E032/E514

Radio Astronomical Observations of Moving Clouds of Plasma in the Solar Supercorona

certain predictions capable of empirical verification. The effect is explained by the screening of the source of radio emission by a plasma cloud moving in the supercorona. It is estimated that possible velocities lie between 2500 and 15 000 km/sec. The screening of the source may be due to 1) absorption of radio waves; 2) refraction; 3) scattering. The relative importance of these effects is estimated. If the cloud absorbs the radio waves, then the electron concentration should be between 5×10^5 and 5×10^7 at temperatures of 10^4 to 10^6 deg. If it is assumed that the reduction in the intensity is due to refraction, then the electron densities should be $10^6 - 10^7$ cm^{-3}. Thus, if refraction is in fact responsible for this effect, then the reduction in the intensity can be explained by the presence of a symmetrical plasma lens with a characteristic linear dimension of 0.5×10^6 km and an electron density of $10^6 - 10^6$ cm^{-3}. Finally, if there is scattering of radio waves in the plasma cloud, then electron concentrations should be 1700 to 1.7×10^6 cm^{-3} for irregularities in the range 1-10^6 km. Turbulent motion may give rise to such irregularities which could

Card 2/3

3724
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E032/E514

Radio Astronomical Observations of Moving Clouds of Plasma in the Solar Supercorona

possibly be maintained by the magnetic field. It is estimated that the number of ejections of the above type from the Sun as a whole is about 10 per hour. It is possible that the plasma clouds are in fact corpuscular streams whose geophysical effects are relatively well known. Further research is necessary in this connection. There are 2 tables and 6 references: 4 Soviet and 2 non-Soviet.

ASSOCIATION: Fizicheskiy institut imeni P. N. Lebedeva Akademii nauk SSSR (Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR)

SUBMITTED: March 29, 1960

Card 3/3

VITKEVICH, V. V.

Development of radio astronomy in the United States. Astron.zhur. 37 no.6:1131-1141 N-D '60. (MIRA 13:12)
(United States--Radio astronomy)

3.1710

80055
S/020/60/132/01/21/064
B014/B014

AUTHORS: Vitkevich, V.V., Kuz'min, A.D., Sorochenko, R.L., Udal'tsov, V.A.

TITLE: Radioastronomical Observations of the Second Soviet Cosmic Rocket

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 132, No. 1, pp. 85-88

TEXT: The frequently used method of radiointerference was employed for observing radio signals of the second Soviet cosmic rocket. The angular coordinates of the container were measured by means of the scientific instruments, furthermore the power of the signals received and its variations with time. A buzzer signal was used because of the increased stability of the instruments, the first and second heterodyne were stabilized by means of quartz. The distance between the antennas of the radiointerferometer, which were directed to the east, was 175.9 m. The angle between the perpendicular on the line connecting the antennas and the direction to the signal source was measured by means of the radiointerferometer. Formula (1) is given for the determination of this angle, and formula (3), in which the Doppler effect is considered, is derived for the azimuth of the signal source. The radiointerferometer is adjusted according to

Card 1/3

Radioastronomical Observations of the Second Soviet Cosmic Rocket

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the intensity of cosmic radio sources. This system permitted exact determination of the moment at which the Soviet rocket hit the Moon, as well as of the place at which the container is located. Fig. 1 shows a copy of the recorded signal in the final stage of the rocket's flight to the Moon. It is shown that the recording lost its sinusoidal character (caused by interferences) as soon as the container hit the Moon. The rocket reached the Moon on September 14, 1959, 0 h 2 min 22 sec. The place of the container was established from formula (3) and is shown in Fig. 3. The power of the signal received was determined by comparing it with the intensity of the cosmic radio source of Cygnus-A. Fig. 3 further illustrates recordings made during the last days before the arrival of the rocket on the Moon. Periodic intensity variations of 45 seconds, 45 minutes, and 10 - 13 minutes were observed. In this connection the authors refer to the periodic variation in the orientation of the container and to the Faraday effect detected in the ionosphere. There are 3 figures, 1 table, and 8 references, 7 of which are Soviet.

ASSOCIATION: Fizicheskiy institut im. P.N. Lebedeva Akademii nauk SSSR (Physics Institute imeni P.N. Lebedev of the Academy of Sciences of the USSR)

VITKEVICH, V. V.

"On the structure of supercorona."

report to be submitted for the IAU Symposium on the Corona, Cloudcroft, New Mexico, 28-30 Aug 1961.

3.1700 (1076,1126)

S/030/61/000/005/002/012
B 105/B202

AUTHOR: Vitkevich, V. V.

TITLE: Important center of radioastronomy

PERIODICAL: Akademiya nauk SSSR. Vestnik, no. 5, 1961, 23 - 32

TEXT: The author describes the development of radioastronomy. In the USSR, the leading institution in this field is the Laboratoriya radioastronomii Fizicheskogo instituta im. P. N. Lebedeva Akademii nauk SSSR (Laboratory of Radioastronomy of the Physics Institute imeni P. N. Lebedev of the Academy of Sciences USSR). The main scientific work of this laboratory is conducted at the Okskaya radioastronomicheskaya stantsiya (Oka Radioastronomical Station) which is being constructed, and partly at the Krymskaya nauchnaya stantsiya (Crimean Scientific Station). The studies cover problems of radio-frequency emission, supercorona of the sun, discrete sources in the galaxy and metagalaxy, on the planets and the moon, and in hydrogen of the 21-cm line. The new center of radioastronomy, the scientific station at the Oka, is being equipped with up-to-date scientific instruments. P. D. Kalachev and A. Ye. Salomonovich designed a radiotelescope

Card 1/3

Important center of radioastronomy

of the moon and the planets. By means of radio measurements on the 8 mm wave. A. Ye. Salomonovich observed that the part of the Venus irradiated by the sun is hotter than that wich is not irradiated. Radar studies on the Venus are found to be important and necessary. On the basis of such studies of the Akademiya nauk SSSR (Academy of Sciences USSR) it can be assumed that the period of rotation of this planet is about 11 days. Radioastronomy offers wide possibilities for studying the moon and its surface. The data on moon and planets are of great use for space travel. The program of the laboratory provides for further studies in this field. There are 2 figures.

Card 3/3

26658
3.2300 (1042,1060) S/560/61/000/007/002/010
E032/E114

AUTHORS: Vitkevich, V.V., Kuz'min, A.D., Sorochenko, R.L., and Udal'tsov, V.A.

TITLE: Results of radio-astronomical observations obtained with Soviet space rockets

PERIODICAL: Akademiya nauk SSSR. Iskusstvennyye sputniki Zemli, No.7, Moscow, 1961, pp. 23-31

TEXT: An important problem in satellite and rocket experiments is the determination of the coordinates of the space vehicles. Since the satellites and rockets usually carry a stabilized transmitter, the problem is reduced to the determination of the position of the radio source and is analogous to the radio-astronomical problem of the determination of the angular coordinates of discrete sources. Such determinations are usually carried out by the radio-interferometer method. The present authors have used this method in the observation of the radio signals from the first, second and third Soviet space rockets. The use of radio astronomical methods has enabled them to measure the intensity of the signals as well. The observations were carried out on 183.6 Mc/s. The apparatus and the experimental

Card 1/8

method employed are described by the present authors in Ref.1 (Radiotekhnika i elektronika, 1961). The impact of the second space rocket container on the lunar surface occurred on September 14, 1959, at 0 hr 02 min 22±1 sec (this time is corrected for the time of propagation of the signal). The selenographic coordinates of the centre of the region of impact were found to be; latitude 30°, longitude -3° (crater Archimedes). During the observations of the first and second space rockets use was made of antennas with horizontal polarization. It is clear from the records obtained that in addition to a "quasi-sinusoidal" intensity variation due to interference there were also faster changes, which were apparently due to the rotation of the container. The period of these changes was 30-50 sec for the first and 40-60 sec for the second rocket. Comparisons of the records of signals from Soviet space rockets with those for known discrete sources of radio emission were used to estimate the intensity of the signal throughout the entire period of observations. The Cyg A source was used for the comparison. Figs. 4 and 5 show the variations in the intensity of the signals (slow component) in units of the power reduced to an isotropic emitter at the distance of the

rocket. A consideration of these curves shows that in addition to the fast changes mentioned above there were also slower variations in the signal from the first space rocket (characteristic periods 8-12 min and 40-60 min). In the case of the second rocket there was a period of 45 min reducing to 10-13 min. These changes may be due to the rotation of the container and the Faraday effect in the earth's atmosphere. In the case of the third rocket antennas with both horizontal and vertical polarization were employed. Typical records are reproduced. Analysis of the intensity records with two mutually perpendicular polarizations showed that there was signal fading on October 4, 5, 6, 12 and 17, 1959, with a period of about 3 min. In addition there was a signal variation reducing the amplitude to about 50% which had a period of about 1.5 min. These variations are apparently due to the rotation of the automatic inter-planetary station. There was some evidence that there was a further variation with a period of 20-30 min, and this may be due to the Faraday effect. The energy flux p was calculated from the expression

$$p = j\Delta f \cdot m$$

Card 3/8

where j is the energy flux from a discrete source with a continuous spectrum, Δf is the bandwidth of the receiver used to record the discrete source, and m is the ratio of the space-rocket to discrete-source signal. The emitted power P was calculated from:

$$P = p 4\pi R^2$$

where R is the distance from the earth (isotropic source emitting equally in both polarization components).
There are 7 figures and 7 references: 2 Soviet and 5 English.
The four most recent English language references read:

Ref.4: P. Moore, Nature, V.184, 502, 1959.
Ref.5: H.P. Wilkins, Nature, V.184, 502, 1959.
Ref.6: G. Fielder, Nature, V.185, 11, 1960.
Ref.7: G. Whitfield, Paris Symposium on Radio Astronomy, Stanford, California, 1959, p. 299.

3, 1720 (1041, 1124, 1127)

30752
S/141/61/004/003/002/020
E133/E435

AUTHORS: Vitkevich, V.V., Lotova, N.A.

TITLE: On the influence of the supercorona on the radio emission received from the Sun

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika. 1961, Vol.4, No.3, pp.415-424

TEXT: Occulations of Taurus A have indicated inhomogeneities in the electron density of the supercorona from 4.5 to 30 $R_\odot$. The anisotropic scattering of solar radiation which results from these inhomogeneities changes our radio picture of the Sun considerably. Previous calculations, allowing for this scattering, have ignored two factors: (a) the scattering regions in the supercorona are at a finite distance from the active regions of the solar surface; (b) the inhomogeneities are not isotropic. The present article allows for both of these effects. It is assumed that the inhomogeneities are radial in form, i.e. the scattering function $\Psi(x)$ is a function only of x - the distance to the centre of the Sun. The authors consider first the results obtained in earlier work (Ref.10: Izv. VUZ, Radiofizika, 3, 595 (1960)) for scattering regions which

Card 1/5(1

are at an infinite distance from the Sun. These results gave a relation between $\Phi^2(r_1)$ and $\Psi^2(x)$

$$\Phi^2(r_1) = 2\int_{r_1}^{\infty} \Psi^2(x)\,\frac{x\,dx}{\cos\alpha\sqrt{x^2-r_1^2}} = \frac{2}{r_1}\int_{r_1}^{\infty} \Psi^2(x)\,\frac{x^2dx}{\sqrt{x^2-r_1^2}}. \qquad (1)$$

Here, Φ is the scattering angle and r_1 is the minimum distance from the Sun to the line of sight. The authors modify this result to give

$$\Phi^2 = \int_{x_1}^{x_2} \Psi^2(x)\,\frac{R_1^2(x)}{R_0^2}\,dx, \qquad (7)$$

where R_1 is the finite distance to the source and R_o is the source-receiver distance. The assumption that scattering regions are at infinity implies that one is dealing with plane waves. Hence, assuming that these regions are at finite distances is equivalent to assuming spherical waves. In the earlier paper (Ref.10) it was assumed that $\Phi = k/r^m$. This is taken over to

Card 2/5

4

On the influence of the super- ...

the case of spherical waves. It implies that $\Psi(x) = \Psi_0/x^n$ $(n > 0)$, where $m = n = (1/2)$. Functions of the form:

$$(x) = \sum_{i=1}^{N} \frac{k_i}{x^{n_i}}$$

may also be used. Fig.2 shows the variation of η^2 with $x/R_\odot$ for four values of m. Preliminary results indicate that $m \sim 1$ up to distances of 20 $R_\odot$. This shows that the lower layers of the supercorona (below 5 $R_\odot$) have a relatively small effect on the scattering. Values are given in the article for the coefficient η_2^2 which represents the square of the attenuation coefficient for the scattering (due to the finite distance of the scattering regions from the source). It is assumed that $n = 3$. According to the position assumed for the source, η_2^2 is found to vary by a factor of $\approx 2 \times 10^{-2}$. On the basis of their theory, the authors calculate the apparent angular dimensions of active solar regions for three wavelengths (3.5 m, 5.8 m and 12 m). They point out, however, that no great importance should be attached to

4

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